

CLASSIFICATION S-E-C-R-E-T
SECURITY INFORMATION
CENTRAL INTELLIGENCE AGENCY
INFORMATION FROM
FOREIGN DOCUMENTS OR RADIO BROADCASTS

COUNTRY German Democratic Republic
SUBJECT Economic - Coke, gas

REPORT

CD NO.

DATE OF INFORMATION 1952

DATE DIST. 19 May 1953

NO. OF PAGES 4

SUPPLEMENT TO REPORT NO.

50X1-HUM

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REPORT ON EXPERIMENTAL GASIFICATION OF COKE AT LAUCHHAMMER COKERY

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The purpose of this experiment was to determine whether gasification of the new hard coke from Lauchhammer is possible in a standard revolving-grate generator. Contrary to expectations, this experiment must be regarded as a failure. In the case of the mixture ratio designated (in the appended table) under I (75 percent brown-coal briquettes and 25 percent brown-coal hard coke), there were two firing zones in the generator instead of one. The same situation occurred in connection with the mixture ratio specified under II (50 percent brown-coal briquettes and 50 percent Lauchhammer coke). On 28 /sic/ August, the generator exhibited pronounced fire around the rim, whereas the center of the generator was dead and did not contribute to the gasification. On 23 August, only brown-coal briquettes were used, so as to restore normal operating conditions in the generator.

At 0750 hours on 25 August, the generator was again operating normally, and it was subsequently fired with brown-coal hard coke only (100 percent). The fire zone increased from the normal 20-40 centimeters to 180 centimeters, then to 320 centimeters, and, finally, the entire fuel bed was burning, with only 70 centimeters of open space between the upper surface of the fuel and the end of the generator.

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Aside from the fact that the method used may be subject to criticism, it became evident that the Lauchhammer coke is unsuitable for gasification. The surface of the coke burns, while the center does not participate in the reaction and remains comparatively cold. Although the coke has a high capacity for reaction, the extraordinary thickness has such an effect that the surface of the individual lumps of coke reacts and burns, while the coke briquettes as such retain their shape and, although the center becomes hot, the thick outer surface prevents the center part from taking part in the gasification. This is clearly indicated in the experimental results by the increasing CO₂ content, the drop in the wind pressure under the grate, the reduced calorific value, and the fact that at the end of the experiment, it was no longer possible to distinguish the three customary zones (ash zone, zone of incandescence, reduction and subsequent degasification zones). Instead, the generator was filled up with lumps of coke, glowing on the surface, which retained their shape until they were removed and which, for the most part, were removed unburned.

This experiment had to be discontinued on 27 August. Subsequently, the experimental low-shaft blast furnace at the Maxhuetten Plant was charged for the first time with brown-coal hard coke. On 17 September, this experiment, too, was given up as unsuccessful. So far as is known, experiments using coke in cupola furnaces have also failed. Apparently, everything failed because the thickness of the coke prevents controlled combustion. The possibility of pulverizing the coke and then pressing it into briquettes with ores is being considered.

[Appended table follows.]

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Report on the First Experiment on the Gasification of Brown-Coal Hard Coke at the Lauchhammer Cokery in Standard
Revolving-Grate Hot-Gas Generators of the Maxhuetten VEB (People-Owned Enterprise)
(Status: 4 October 1952)

Gas Analyses									Calorific Value (kilocal- ories/nor- mal cu m)	Saturation Tempera- ture (de- grees cen- tigrade)	Gas-exit Tempera- ture (de- grees cen- tigrade)	Wind Pres- sure Under Grate (mm water col)	Gas Pres- sure After Generator (mm water col)
Date	Time	CO ₂	O ₂	CuHm*	CO	CH ₄	H ₂	N ₂					
I. Mixture Ratio: 75% Brown-Coal Briquettes, 25% Lauchhammer Coke													
18/8	0900	5.8	0.0	0.4	26.4	2.1	11.3	54.0	1337	33	358	170	50
	1045	4.0	0.5	0.2	31.6	1.6	9.0	53.1	1358	32	480	180	60
	1140	3.7	1.1	0.2	32.2	1.25	10.5	51.0	1385	32	430	178	55
	1245	4.8	0.2	0.4	31.9	3.1	8.8	50.8	1521	30	370	145	68
19/8	0730	4.4	0.2	0.0	32.4	2.5	14.1	56.5	1557	40	360	135	55
	1040	8.4	0.3	0.0	26.3	3.25	8.7	53.1	1291	39	440	130	70
	1150	5.4	0.4	0.0	31.2	1.89	10.1	51.0	1366	33	440	175	70
	1230	5.0	0.3	0.7	31.4	2.5	10.0	50.1	1540	32	550	185	60
II. Mixture Ratio: 50% Brown-Coal Briquettes, 50% Lauchhammer Coke													
20/8	0645	3.7	0.3	0.3	32.9	3.14	8.0	51.7	1516	35	380	130	65
	0850	3.8	0.4	0.4	32.4	2.2	9.2	51.6	1472	38	510	115	55
	1040	4.2	0.0	0.2	32.2	2.5	9.6	51.3	1469	40	320	120	60
	1130	4.2	0.1	0.2	32.5	3.2	7.6	52.2	1486	38	270	115	60
	1240	4.2	0.3	0.2	32.9	3.1	10.8	48.5	1572	38	250	115	60

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21/8	0640	4.0	0.5	0.5	22.6	3.0	11.6	46.5	1641	38	420	115	60
	0830	3.3	0.0	0.1	33.8	2.8	11.0	49.0	1562	33	372	160	60
	1030	5.6	0.2	0.2	31.0	2.8	12.6	47.6	1536	40	390	140	65
	1210	6.0	0.4	0.4	29.2	3.2	11.5	49.3	1521	38	460	155	70
	1050	7.4	0.4	0.4	27.8	2.9	10.24	50.86	1419	38	410	120	65
	1200	7.4	0.3	0.4	27.9	3.2	12.8	48.0	1515	38	380	120	62
	1300	8.8	0.4	0.2	25.8	3.6	9.5	51.7	1349	38	400	120	65

III.. Mixture Ratio: 100% Brown-Coal Briquettes

23/8	0700	5.4	0.4	0.4	29.8	3.8	12.0	48.2	1602	38	410	120	60
	1130	2.0	0.3	0.4	26.3	4.2	10.8	50.0	1502	40	320	120	60
	1300	6.4	0.2	0.4	26.0	4.7	3.12	59.18	1338	25	320	140	60

IV. Mixture Ratio: 100% Lauchhammer Coke

25/8	0750	3.0	0.0	0.4	33.6	5.7	5.5	51.8	1703	40	320	100	55
26/8	0830	10.0	0.7	0.2	23.0	4.6	7.0	54.8	1304	45	520	110	70
	1130	6.0	0.0	0.4	30.0	2.4	10.6	50.6	1461	32	450	100	55
27/8	0650	9.0	0.0	0.0	25.0	2.0	7.5	56.5	1119	40	360	100	65

* [Probably should read C_{nH_m}]

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